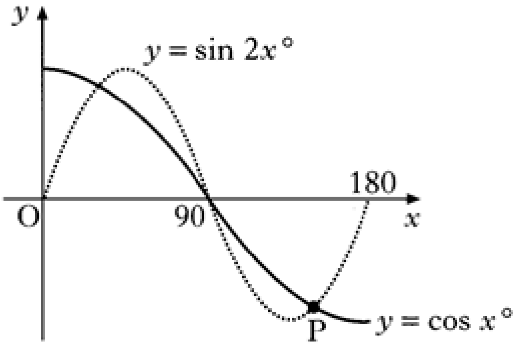
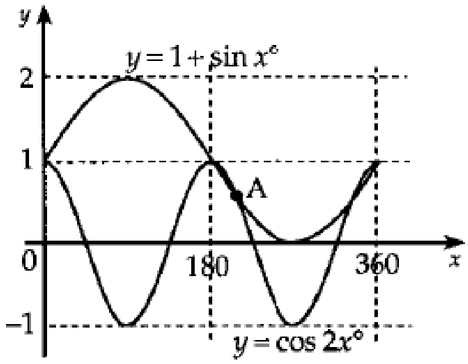
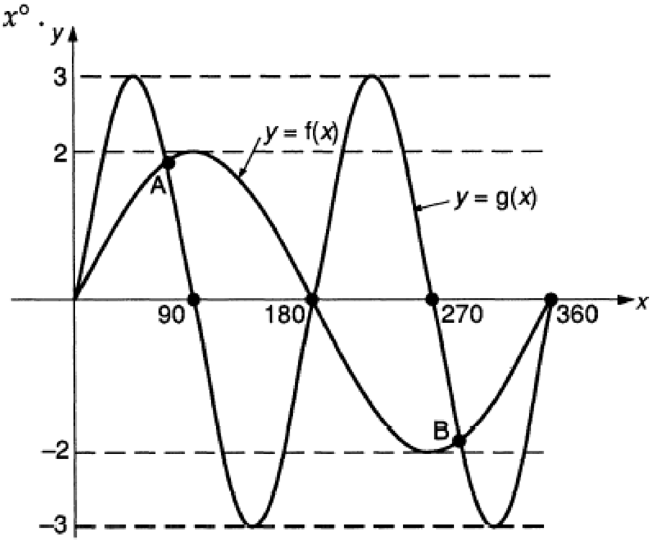
Trigonometric Equations (Degrees)

2000 P2	**A5.** Solve the equation $3\cos 2x° + \cos x° = -1$ in the interval $0 \le x \le 360$.	**5**
2001 P1	**5.** (*a*) Solve the equation $\sin 2x° - \cos x° = 0$ in the interval $0 \le x \le 180$. (*b*) The diagram shows parts of two trigonometric graphs, $y = \sin 2x°$ and $y = \cos x°$. Use your solutions in (*a*) to write down the coordinates of the point P.  	**4** **1**
2002 P1	**3.** Functions f and g are defined on suitable domains by $f(x) = \sin(x°)$ and $g(x) = 2x$. (*a*) Find expressions for: (i) $f(g(x))$; (ii) $g(f(x))$. (*b*) Solve $2f(g(x)) = g(f(x))$ for $0 \le x \le 360$.	 **2** **5**
2006 P1	**7.** Solve the equation $\sin x° - \sin 2x° = 0$ in the interval $0 \le x \le 360$.	**4**
2007 P1	**6.** Solve the equation $\sin 2x° = 6\cos x°$ for $0 \le x \le 360$.	**4**
2008 P2	**5.** Solve the equation $\cos 2x° + 2\sin x° = \sin^2 x°$ in the interval $0 \le x < 360$.	**5**
2011 P1	**23.** (*a*) Solve $\cos 2x° - 3\cos x° + 2 = 0$ for $0 \le x < 360$. (*b*) Hence solve $\cos 4x° - 3\cos 2x° + 2 = 0$ for $0 \le x < 360$.	**5** **2**
2015 EP P1	**7.** (a) Solve $\cos 2x° - 3\cos x° + 2 = 0$ for $0 \le x < 360$. (b) Hence solve $\cos 4x° - 3\cos 2x° + 2 = 0$ for $0 \le x < 360$.	**5** **2**

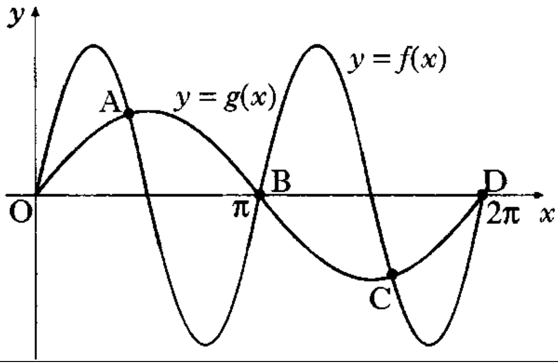
Pre 2000 - Trigonometric Equations (Degrees)

1	(*a*) Show that $2\cos 2x° - \cos^2 x° = 1 - 3\sin^2 x°$. (*b*) **Hence** solve the equation $2\cos 2x° - \cos^2 x° = 2\sin x°$ in the interval $0 \le x < 360$.	2 4
2	Solve algebraically the equation $\sin 2x° + \sin x° = 0$, $0 \le x < 360$.	5
3	Solve algebraically the equation $\cos 2x° + \cos x° = 0$, $0 \le x < 360$.	5
4	Solve algebraically the equation $\cos 2x° + 5\cos x° - 2 = 0$, $0 \le x < 360$.	5

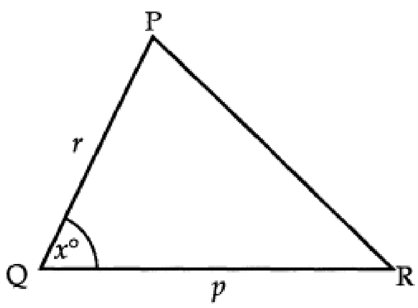
5	The diagram shows two curves with equations $y = \cos 2x°$ and $y = 1 + \sin x°$ where $0 \le x \le 360$. Find the x-coordinate of the point of intersection at A.  	4
6	(*a*) Solve the equation $3\sin 2x° = 2\sin x°$ for $0 \le x \le 360$ (*b*) The diagram below shows parts of the graphs of sine functions *f* and *g*. State expressions for *f*(*x*) and *g*(*x*). (*c*) Use your answers to part (*a*) to find the co-ordinates of A and B. (*d*) Hence state the values of x in the interval $0 \le x \le 360$ for which $3\sin 2x° < 2\sin x°$.  	**(4)** **(1)** **(2)** **(3)**

Trigonometric Equations (Radians)

2001 P1	**7.** Functions $f(x) = \sin x$, $g(x) = \cos x$ and $h(x) = x + \frac{\pi}{4}$ are defined on a suitable set of real numbers. (*a*) Find expressions for: (i) $f(h(x))$; (ii) $g(h(x))$. (*b*) (i) Show that $f(h(x)) = \frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x$. (ii) Find a similar expression for $g(h(x))$ and hence solve the equation $f(h(x)) - g(h(x)) = 1$ for $0 \le x \le 2\pi$.	 **2** **5**
4. (JAN) 02 P2	Solve the equation $\cos 2x - 2\sin^2 x = 0$ in the interval $0 \le x < 2\pi$.	**4**
2003 P2	**10.** Solve the equation $3\cos(2x) + 10\cos(x) - 1 = 0$ for $0 \le x \le \pi$, correct to 2 decimal places.	**5**

2005 P2	**8.** Two functions, f and g, are defined by $f(x) = k\sin 2x$ and $g(x) = \sin x$ where $k > 1$. The diagram shows the graphs of $y = f(x)$ and $y = g(x)$ intersecting at O, A, B, C and D. Show that, at A and C, $\cos x = \frac{1}{2k}$. 	5
2008 SP P1	**24.** Find the solution(s) of the equation $\sin^2 p - \sin p + 1 = \cos^2 p$ for $\frac{\pi}{2} < p < \pi$.	5
2008 SP2 P1	**23.** Solve the equation $\sin 2x - \cos x = 0$ for $0 \leq x \leq 2\pi$.	5
2010 P2	**4.** Solve $2\cos 2x - 5\cos x - 4 = 0$ for $0 \leq x < 2\pi$.	5
2013 P2	**8.** Solve algebraically the equation $\sin 2x = 2\cos^2 x$ for $0 \leq x < 2\pi$	6
2014 P2	**6.** Solve the equation $\sin x - 2\cos 2x = 1$ for $0 \leq x < 2\pi$.	5
2017 P2	**6.** Solve $5\sin x - 4 = 2\cos 2x$ for $0 \leq x < 2\pi$.	5

Pre 2000 - Trigonometric Equations (Radians)

1	If $f(a) = 6\sin^2 a - \cos a$, express $f(a)$ in the form $p\cos^2 a + q\cos a + r$. **Hence** solve, correct to three decimal places, the equation $6\sin^2 a - \cos a = 5$ for $0 \leq a \leq \pi$.	4
2	Solve algebraically the equation $\sin 2x = 2\cos^2 x$ for $0 \leq x < 2\pi$	6
3	The diagram shows an isosceles triangle PQR in which PR = QR and angle PQR = $x°$. (*a*) Show that $\frac{\sin x°}{p} = \frac{\sin 2x°}{r}$. (*b*) (i) State the value of $x°$ when $p = r$. (ii) Using the fact that $p = r$, solve the equation in (*a*) above, to justify your stated value of $x°$. 	(3) (5)

4	For $0 < x < \frac{\pi}{2}$, sequences can be generated using the recurrence relation $u_{n+1} = (\sin x)u_n + \cos 2x$, with $u_0 = 1$. (*a*) Why do these sequences have a limit? (*b*) The limit of one sequence generated by this recurrence relation is $\frac{1}{2}\sin x$. Find the value(s) of x.	2 7
5	The Water Board of a local authority discovered it was able to represent the approximate amount of water $W(t)$, in millions of gallons, stored in a reservoir t months after the 1st May 1988 by the formula $W(t) = 1.1 - \sin\frac{\pi t}{6}$. The board then predicted that under normal conditions this formula would apply for three years. (*a*) Draw and label sketches of the graphs of $y = \sin\frac{\pi t}{6}$ and $y = -\sin\frac{\pi t}{6}$, for $0 \le t \le 36$ on the same diagram. (*b*) On a separate diagram and using the same scale on the t-axis as you used in part (*a*), draw a sketch of the graph of $W(t) = 1.1 - \sin\frac{\pi t}{6}$. (*c*) On the 1st April 1990 a serious fire required an extra $\frac{1}{4}$ million gallons of water from the reservoir to bring the fire under control. Assuming that the previous trend continues from the new lower level, when will the reservoir run dry if water rationing is not imposed?	(4) (3) (3)
6	(*a*) Write the equation $\cos 2\theta + 8\cos\theta + 9 = 0$ in terms of $\cos\theta$ and show that, for $\cos\theta$, it has equal roots. (*b*) Show that there are no real real roots for θ.	3, 1